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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/594,629	09/28/2006	Tomoyuki Takei	AI-432NP	4914
23995 7590 05/14/2008 RABIN & Berdo, PC 1101 14TH STREET, NW SUITE 500 WASHINGTON, DC 20005				
EXAMINER VELASQUEZ, VANESSA T				
ART UNIT		PAPER NUMBER		
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/594,629

Applicant(s)

TAKEI ET AL.

Examiner

Vanessa Velasquez

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Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-946)
- 3) ☒ Information Disclosure Statement(s) (PTO/SE/CI)
Paper No(s)/Mail Date Sept. 28, 2006; Jan. 16, 2008
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

Claims 1-9 are pending and presented for examination.

Priority

1. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy of JP 2004-119360, filed in Japan, has been received and placed of record in the file.

Information Disclosure Statement

2. Two (2) information disclosure statements (IDS) were filed on Sept. 28, 2006 and Jan. 16, 2008. The submissions are in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are being considered by the examiner.

Claim Objections

3. Claim 4 is objected to because of a possible translation error. It appears that applicant means that the balance or remainder, as opposed to "residual," comprises iron. Clarification is required.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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7. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online).

Regarding Claim 1, US '337 is drawn to a power transmission shaft product. The shaft structure comprises a notched portion that functions as torque transmitting teeth (US '337, col. 2, ln. 5-10). Examples of such structures are illustrated in Figures 2, 5, and 6(b) (US '337). Figure 6(b) illustrates gear teeth and teeth bottoms (US '337). The shaft and teeth are both fabricated from induction hardened (quenched and tempered) medium carbon steel (US '337, col. 4, ln. 1-9).

Still regarding Claim 1, the medium carbon steel contains carbon (0.39 – 0.49 wt.%) and silicon (0.4 – 1.5 wt.%) (US '337, col. 2, ln. 12-14), and may further contain molybdenum (0 – 0.4 wt.%) (US '337, col. 3, ln. 24-25) as well as boron (0.001 – 0.004 wt.%) (US '337, col. 3, ln. 3-8) to enhance hardness. The overlap between the ranges taught by the prior art and the claimed ranges is sufficient to establish a *prima facie* case of obviousness (MPEP § 2144.05 "Overlap of Ranges").

Still regarding Claim 1, US '337 is silent as to the surface hardness of the pinion teeth and shaft achieved via induction hardening. However, Hassell et al. teach that although hardness ultimately depends on the carbon content of the steel (Hassell et al., "Control of Surface Hardness," p. 28), surface hardness can be selectively modified by applying appropriate induction conditions (Hassell et al., "Selective Hardening," p. 3; "Gears," p. 17). Therefore, producing a shaft and gear of US '337 with a desired

hardness such as 650-760 HV as claimed would merely involve routine experimentation for one of ordinary skill in the art, as taught by Hassell et al.

Regarding Claim 2, manganese may be present in an amount not exceeding 0.4 wt.% (US '337, col. 2, ln. 40-45).

Regarding Claim 3, there is no mention of chromium, copper, or nickel in the composition of US '337; thus, they will be regarded as being absent from the disclosed composition. Because the claimed ranges encompass zero percent and the composition of US '337 does not contain the claimed elements, a prima facie case of obviousness can be made because the claimed ranges and the ranges taught by the prior art overlap.

Regarding Claim 4, US '337 teaches that the steel composition may further comprise the following elements, in percent by weight:

Phosphorous	0 – 0.02	(US '337, col. 2, ln. 14-15)
Sulfur	0 – 0.025	(US '337, col. 2, ln. 14-15)
Titanium	0.02 – 0.05	(US '337, col. 3, ln. 4)
Nitrogen	0 – 0.008	(US '337, col. 3, ln. 4-5)

Still regarding Claim 4, US '337 in view of Hassell et al. fails to teach the claimed equations. However, such equations would not result in a patentable difference because it has been held that there is no invention involved in the discovery of a general formula if it covers a composition described in the prior art.

Regarding Claim 5, US '337 is silent as to the hardness of the layer underneath the surface hardened layer. However, Hassell et al. teach that surface hardness can be

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selectively modified by applying appropriate induction conditions (Hassell et al., "Selective Hardening," p. 3; "Gears," p. 17). In addition, Figure 52 on page 22 (Hassell et al.) exemplifies how hardness can vary throughout an induction hardened article. Therefore, producing a shaft and gear of US '337 with a hardness of 260-300 HV as claimed under the surface hardened layer would merely involve routine experimentation for one of ordinary skill in the art to obtain a product with desired properties, as taught by Hassell et al.

8. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online) as applied to claims 1 and 2 above, and further in view of Watari et al. (US 6,475,305).

Regarding Claim 3, US '337 in view of Hassell et al. fails to teach a medium carbon steel containing chromium, copper, and/or nickel. However, US '305 teaches a steel composition similar to that of US '337, wherein the steel may further comprise chromium in amount up to 2.0 mass% to improve hardness (US '305, col. 8, ln. 1.15); copper, in an amount up to 1.5 mass% to enhance hardness (US '305, col. 7, ln. 41-55); and nickel, in an amount up to 2.0 mass% to improve hardness and toughness (US '305, col. 7, ln. 56-67). Therefore, it would have been obvious to one of ordinary skill in the art to add one or more of the aforementioned elements to the composition of US '337 in view of Hassell et al. in order to improve the hardness and toughness of the steel alloy, as taught by US '305.

9. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al. (US 6,319,337) in view of Hassell et al. ("Induction Heat Treating of Steel," Vol. 4, ASM Handbooks Online) as applied to claim 1 above, and further in view of Iguchi et al. (US 6,270,596).

Regarding Claims 6 and 7, US '337 in view of Hassell et al. is silent as to the hardened layer ratio of the serrated (toothed) portion of the shaft. However, US '596, also drawn to a shaft comprising an alloy with a chemical composition similar to that of US '337, teaches that it is preferable that the shaft component not have a hardening depth ratio less than 0.25 (US '596, Abstract, col. 5, ln. 8-13). Here, the hardening depth ratio is defined as the distance from the surface of the component to a position within the component where the hardness is 500 HV divided by the radius of the component (US '596, Abstract, col. 5, ln. 8-10). Ensuring that the hardening depth ratio does not fall below 0.25 results in a component with improved torsional fatigue strength (US '596, col. 5, ln. 10-13). Thus, it would have been obvious to one of ordinary skill in the art to apply the hardening layer ratio taught by US '596 to the serrated portion of the shaft of US '337 in view of Hassell et al. to ensure that the toothed portion has sufficient fatigue strength.

Regarding Claims 8 and 9, US '337 in view of Hassell et al. is silent as to the hardened layer ratio of the shaft. However, US '596, also drawn to a shaft comprising an alloy with a chemical composition similar to that of US '337, teaches that it is preferable that the shaft component not have a hardening depth ratio less than 0.25 (US

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'596, Abstract, col. 5, ln. 8-13). Here, the hardening depth ratio is defined as the distance from the surface of the component to a position within the component where the hardness is 500 HV divided by the radius of the component (US '596, Abstract, col. 5, ln. 8-10). Ensuring that the hardening depth ratio does not fall below 0.25 results in a component with improved torsional fatigue strength (US '596, col. 5, ln. 10-13). Thus, it would have been obvious to one of ordinary skill in the art to apply the hardening layer ratio taught by US '596 to the shaft of US '337 in view of Hassell et al. to ensure that the toothed portion has sufficient fatigue strength to withstand torsional forces.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Velasquez whose telephone number is (571)270-3587. The examiner can normally be reached on Monday-Friday 8:30 AM-6:00 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached at 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
Supervisory Patent Examiner, Art
Unit 1793

/Vanessa Velasquez/
Examiner, Art Unit 1793